Intel® Education
Lab Camera
by Intellisense

Intel® Education Lab Camera by Intellisense

Windows 7 / Windows 8 Desktop
User manual

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INTRODUCTION

Lab Camera is a web camera based natural science exploration and data logging laboratory that allows students and teachers to carry out substantial scientific observations and measurements, using a computer and the software.

The software has currently seven functions all of them are very easy to use. Students can use it in class or even to solve their homework, but it also encourages independent experiments that can be carried out effectively, giving further boosts to Science based subjects. Lab Camera arouses curiosity about the surrounding world around you and it ignites creativity in how you explore it.

This User Guide provides an overview of the components and all features of LabCam.

Enjoy experimenting!

GENERAL INFORMATION

Protect the environment & yourself

Please do not harm any animals, plants, or the surrounding environment when you carry out experiments with LabCam. Experiment responsibly and carefully for your own safety. Lab Camera takes no responsibility for any damages that might occur during your use of the software. While we are confident that Lab Camera is one of the safest ways to undertake science experiments, please enjoy the software at your own risk!

COMMON FEATURES

Camera settings | Press this button to set camera properties such as brightness, contrast, sharpness etc. Use the flip option in case your camera image is mirrored. If you have several cameras attached to your device, you can choose which one the software should use and set it's frame rate and resolution. NOTE: the software automatically sets optimal values.

Resize panels | Change thumblist and main panel size ratio.

Press top bar of the application to display the following options:

Home | Close current module and return to the main menu. Note: the Home button is also available in the top right corner of the application.

Help | Press this button to display help settings panel.

In help settings you have the following options available:

- Show quick guide: show a semi-transparent canvas with tooltips.
- Use the checkbox to toggle quick guide visibility at startup.
- Use the radio button to change visibility of button labels.
- User manual: display the user manual.
- WebCam Laboratory website: navigate to company website.
- About Lab Camera: show software version information and credits.

TIME LAPSE

The Time Lapse function helps you observe and better understand the slow processes in nature, such as the formation and migration of clouds, ice melting, the growth of plants, etc. The software makes still shots in configurable intervals and stitches these images into a coherent stream of video.

Recording Mode

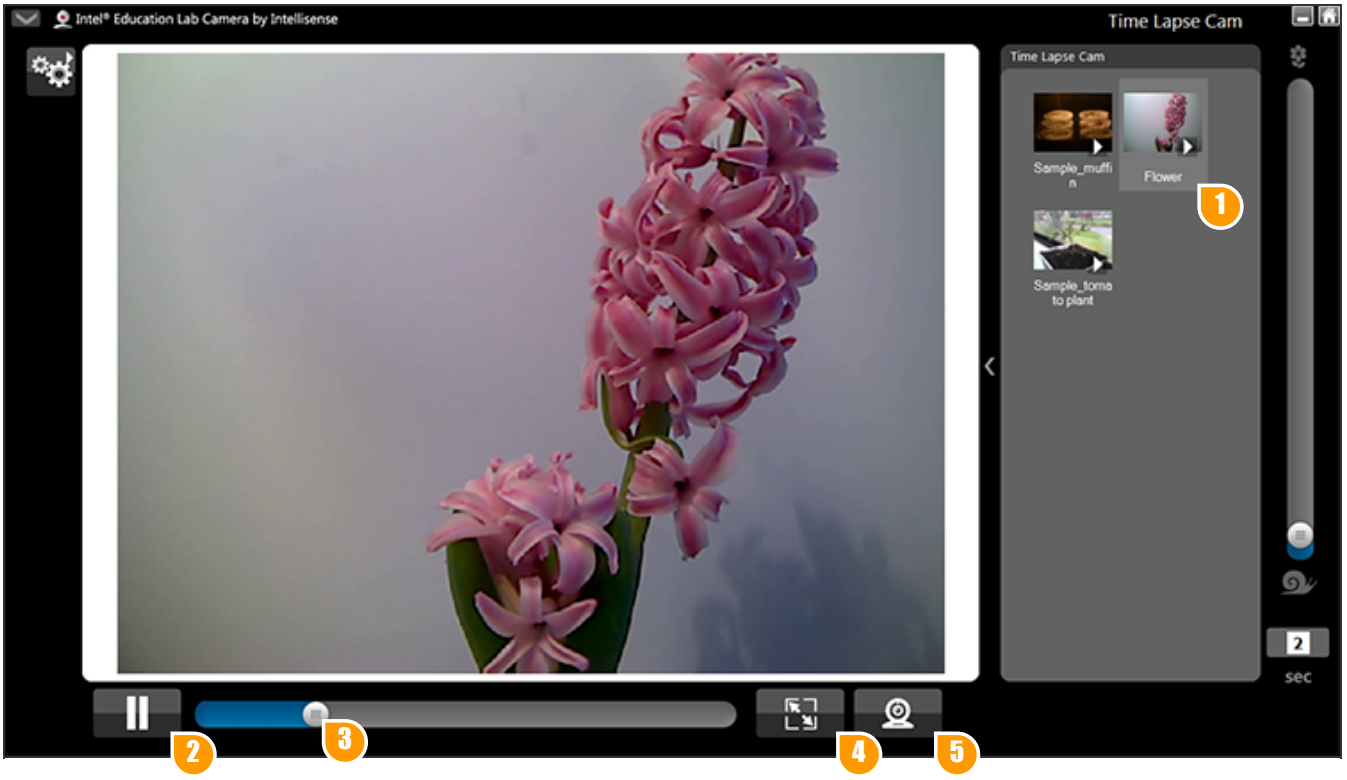
1. Your camera will start automatically upon software start up. Its stream will be visible in the camera window.
2. Set time interval between frames.
3. Press Record button to start recording. A red frame around the camera window will start blinking.
   Press again to stop recording. Your recorded video will start automatically.
4. Your recorded video will be added to the thumb list. The video file will be saved to your external storage in "/Lab Camera/TimeLapse" folder.

Display settings

a. Show frame counter.
b. Show length of recording.
c. Show timestamp. Timestamp will not only be visible on the screen, but will get displayed in the recording.

Show frame intervals.

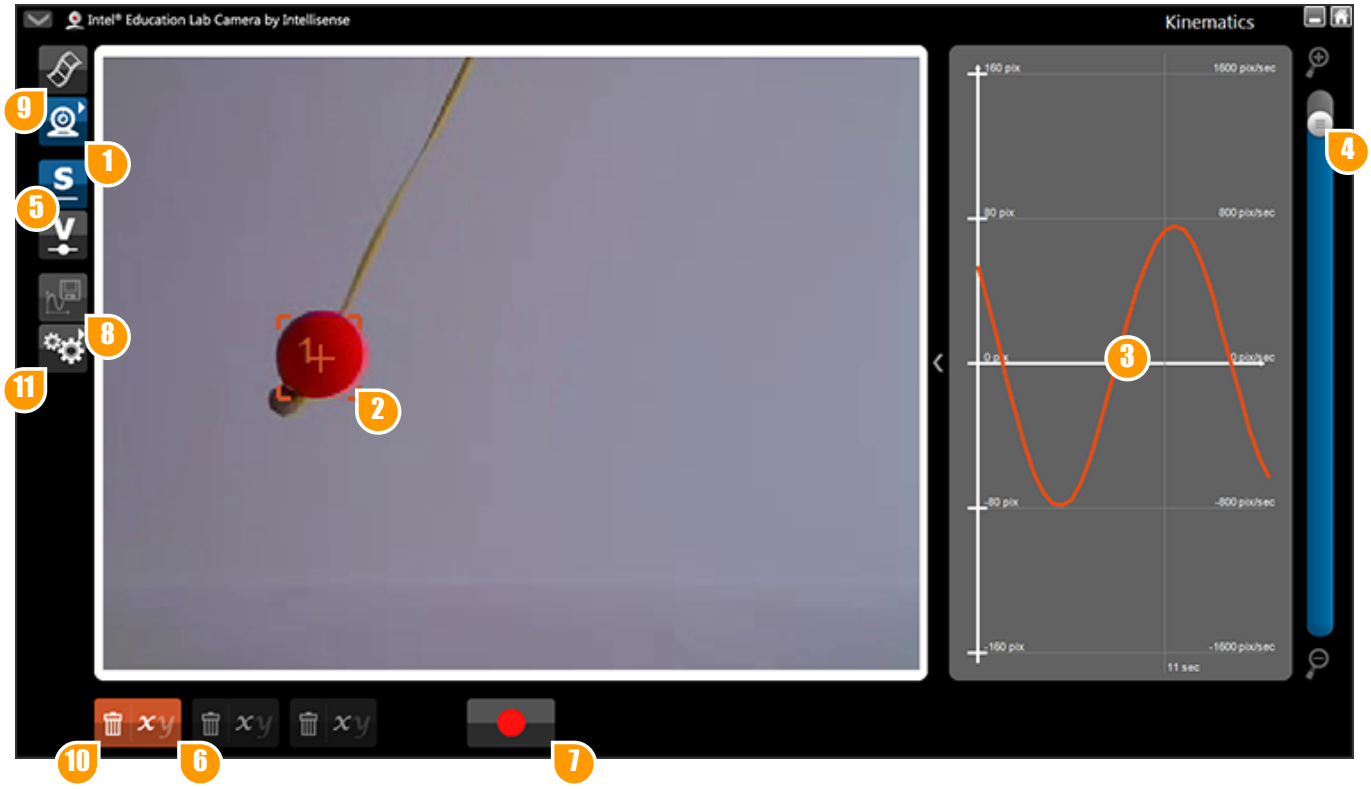
Playback Mode.



1. Double click on thumbnail to play video. Note: right clicking or longer press on thumbnail will display file menu.
2. Press to play / pause video.
3. Use the seek bar to jump to desired fragment.
4. **Full screen mode** | Play video in full screen mode.
5. **Go back to camera** | Switch to camera view.

KINEMATICS

The Kinematics function allows tracking of the horizontal and vertical movement characteristics (displacement, velocity, and acceleration) of one or more objects in real time. The software is capable to capture a maximum of 3 selected objects at the same time, allowing complex kinematic experiments.



1 Press this button to choose from the following options:

Default camera view.

Eliminate background. This view will display your object as a circle colored to the color of your object(s).

This view will display a gradually fading trace of the object(s).

This view will display a permanent trace of the object(s).

Show diagram on the camera screen.

2 Press the screen to select the object for tracking. When selected, the object will be bounded by a colored frame. You can select up to 3 objects.

3 Object characteristics (displacement s(t), velocity v(t)) will be displayed in the diagram panel.

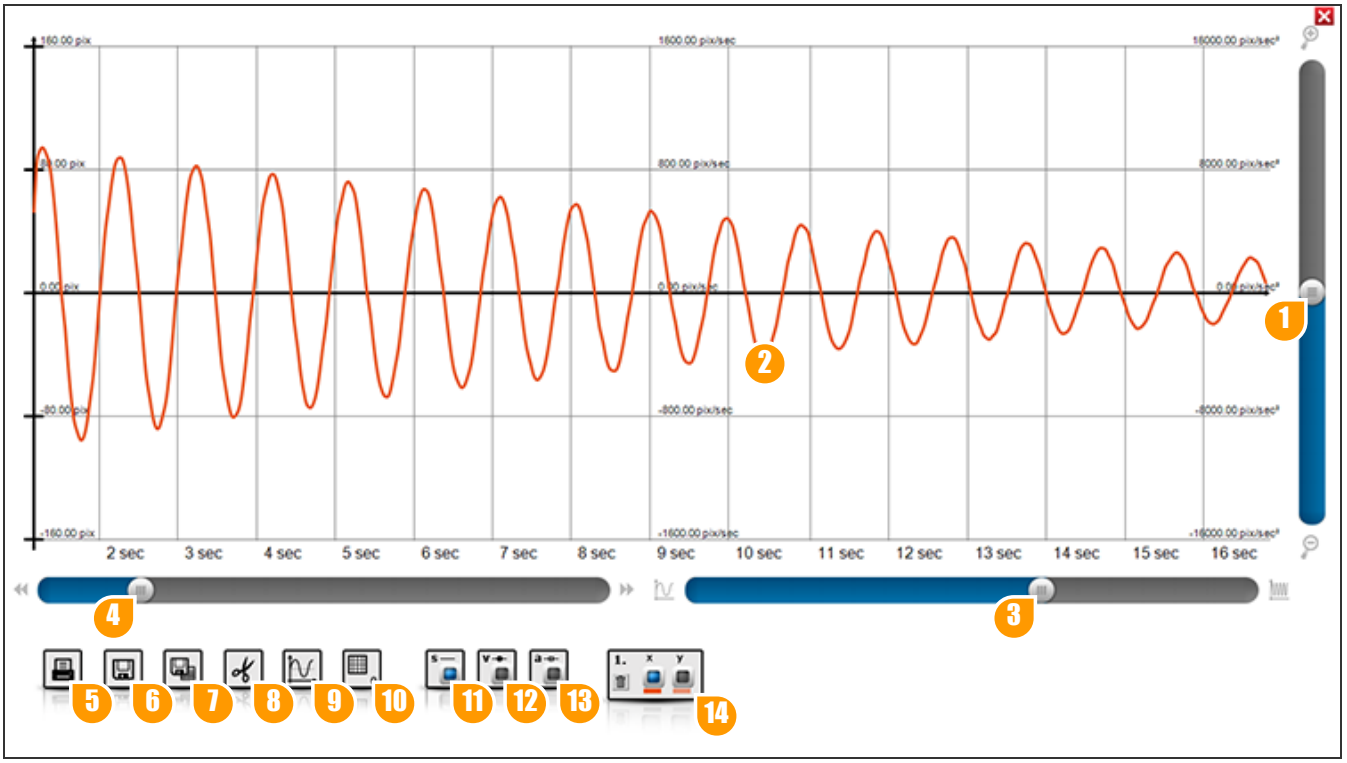
4 Set diagram density.

5. Choose to display displacement, velocity or both.
6. Choose which axis you would like to monitor. Press to select x, y or xy.
7. Press to start recording. A red frame around the camera window will start blinking.
8. Press to display recorded diagram. NOTE: this button gets active after successful recording.
9. Load a pre-recorded video. This feature is particulary useful if there is no time for a real-time setup or the experiment can be dangerous.
10. Delete object.
11. Press this button to choose from the following options:

Calibration process: Place an object of known size into the camera's field of vision at the same distance your target object is. Next mark the known size with the calibration tool, input the size value and define the measurement unit.

Set color sensitivity, diagram filter or toggle highlight mode. Use the red coordinate axes to define the origin of your object's movement graph.

Diagram View



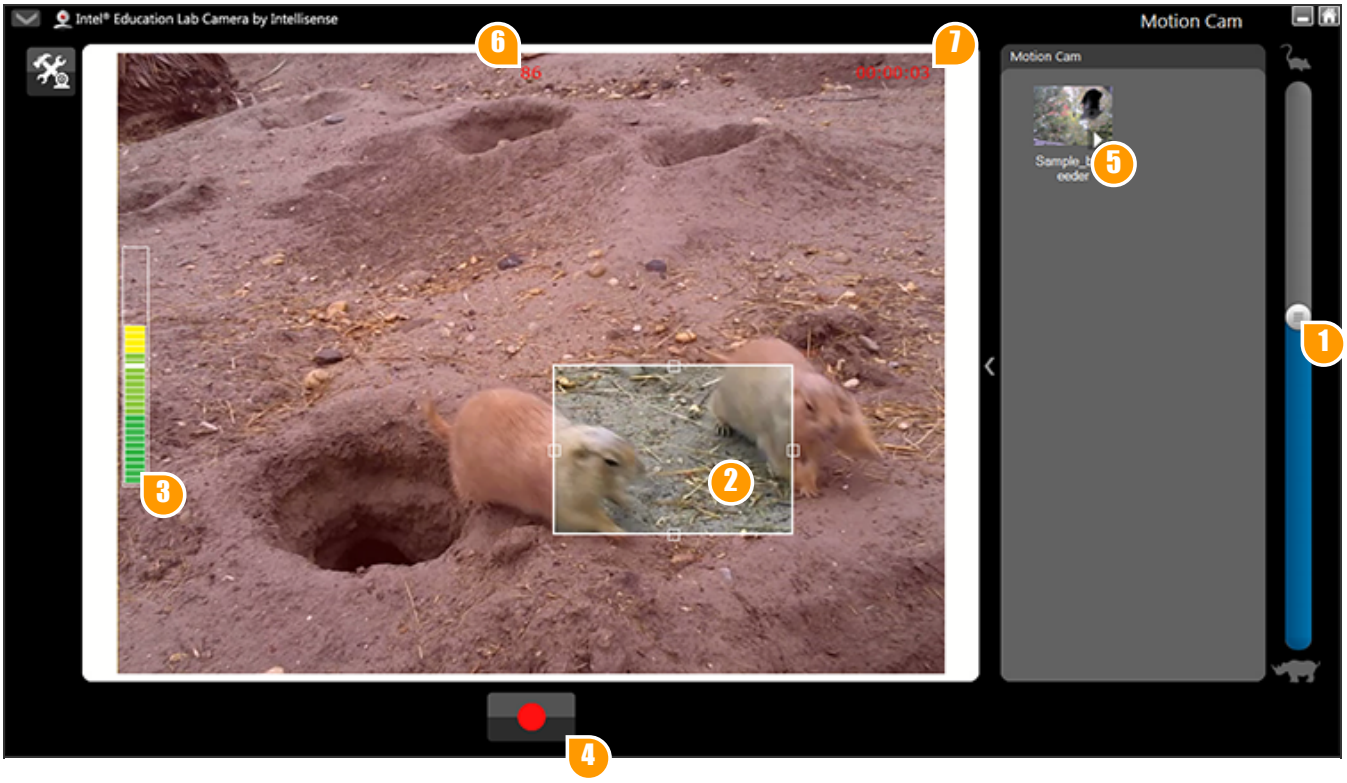
1. Zoom
2. By selecting a point in the diagram, you can display its value and make the diagram draggable vertically.
3. Diagram density
4. Time
5. Print.
6. Save as image

7. Save data table
8. Cut
9. Smooth diagram. Note: In some cases smoothing can significantly alter your diagram.
10. Set grid density.
11. Display s(t) (displacement).
12. Display v(t) (velocity).
13. Display a(t) (acceleration).
14. Chose movement axis along which you would like to display your diagram.

MOTION CAM

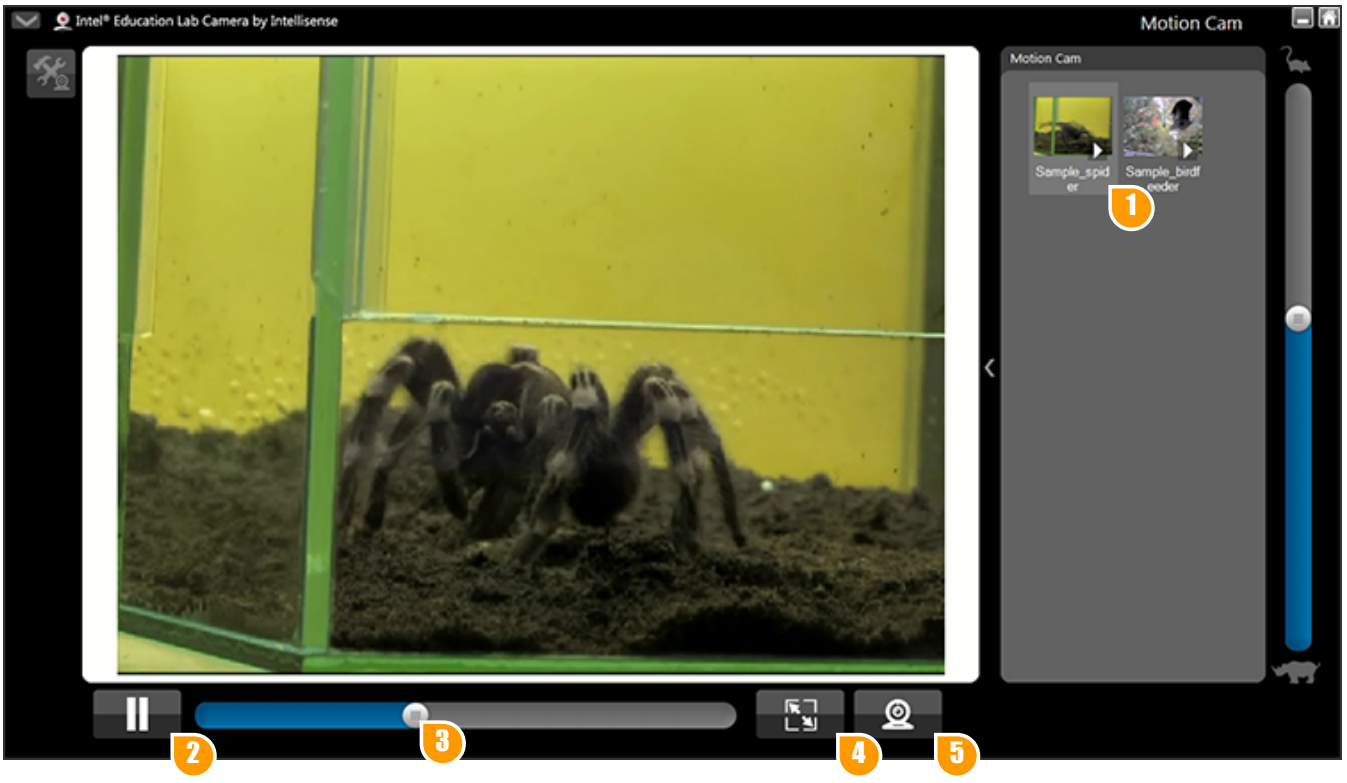
The Motion Cam function makes a recording when it detects movement in front of the camera, allowing you to capture rare and intimate situations in nature. It works just like motion-sensor cameras.

Recording Mode



1. Drag to set how sensitive the software should be to movement speed.
2. Set the bounding box to the desired size. The bounding box indicates the area where movement detection is active, e.g. if you want to record activity around a bird feeder, limit the size of the bounding box to it's close vicinity.
3. The motion level indicator shows the actual motion level. The recording is triggered whenever the indicator exceeds the threshold line.
4. Press Record button to start recording. standby: A red frame will get displayed A red frame around the camera window will start blinking.
5. After all is set, tap the Record button to switch to recorder standby mode. Recording will start when the motion level in the sensitive area exceeds threshold set by the motion level slider.
6. Show frame counter.
7. Show length of recording.

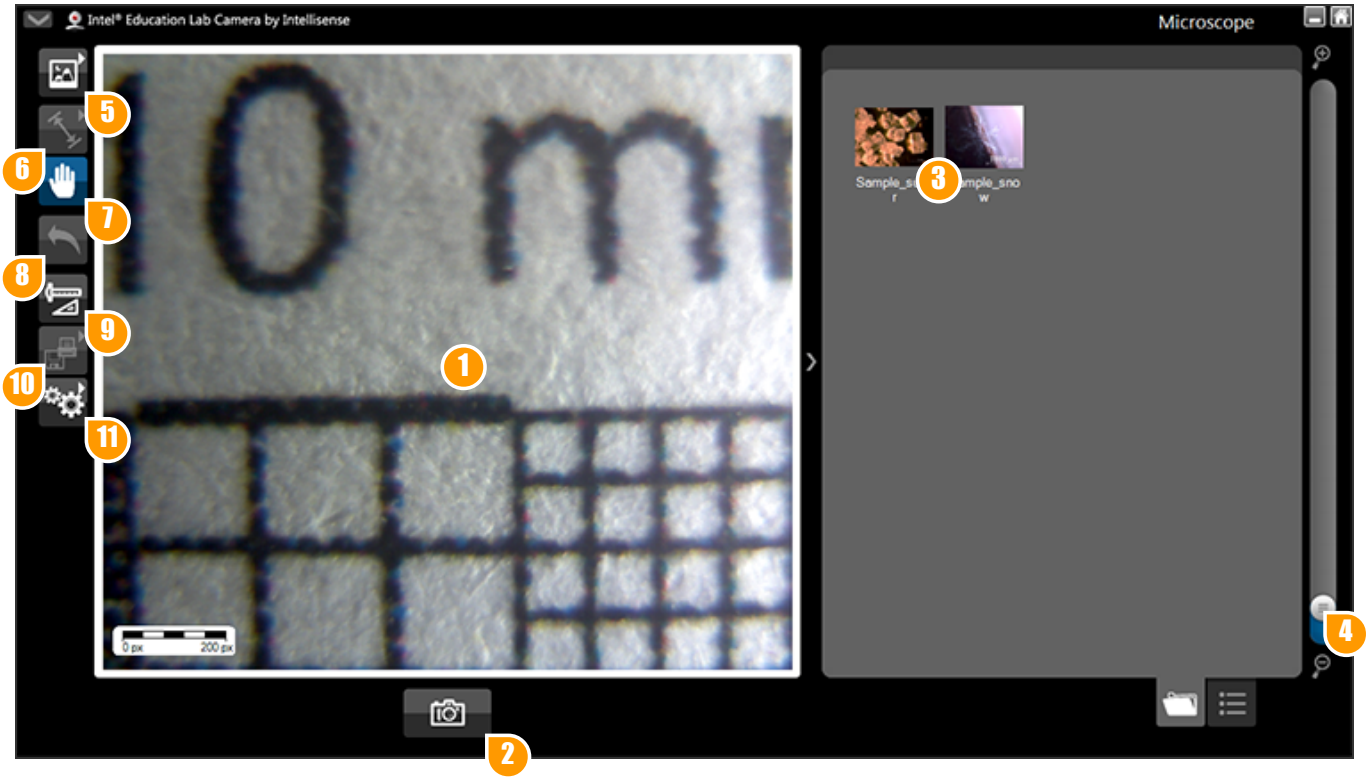
Playback Mode.



1. Double click on thumbnail to play video. Note: right clicking or longer press on thumbnail will display file menu.
2. Press to play / pause video.
3. Use the seek bar to jump to desired fragment.
4. **Full screen mode** | Play video in full screen mode.
5. **Go back to camera** | Switch to camera view.

MICROSCOPE

The Microscope feature allows you to carry out microscopic measurements and also to perform any kind of measurement when a reference value is available (ie. the moon's diameter). Web cameras are able to capture extremely close shots, so even single-celled organisms can be observed as well.



1 Your camera will start automatically upon software start up. Its stream will be visible in the camera window.

2 **Take a picture** | Press to take a still image from the camera stream.

3 Load image from thumb list. Note: right clicking or longer press on thumbnail will display file menu.

4 Zoom

5 Press this button to choose from the following options:

Load image | Load an image from your hard drive to carry out measurements after calibration. Note: in order to calibrate, your image should contain an element the size of which is known.

Load document | Load a project in .mic format.

6 Press this button to choose from the following options:

Measure distance | Mark two points to measure distance between them. Note: measurement icon is only available if the image is calibrated.

Angle measurement | Click the endpoint of the first segment, next click the vertex and finally the endpoint of the second segment. The distance will be calculated automatically.

Measure area | Click around the desired area to bound it. Make sure the last click will be same point as your starting point. The area will be calculated in pixels or in

measurement units defined during calibration. The more segments you define, the closer your measurement will be to the area of the real object.

7 **Move the image** | Click and drag to pan your image when zoomed.

8 **Undo** | Press to undo last measurent. You can undo as many measurements as you want.

9 **Size calibration** | Calibration enables you to carry out measurements based on a reference item. Place an object of known size in front of the camera and click the calibration button. Next mark the starting and ending points of the known segment and define the value and measurement units. From now on all measutrements will be calculated in reference to the defined segment.

10 Press this button to choose from the following options:

Save in image format | You can save your work as plain image, image along with your measurements and as a measurement protocol page.

Print | Print your work as plain image, image along with your measurements or as a measurement protocol page.

Save in Microscope format | Your project will be saved in .mic format for later use.

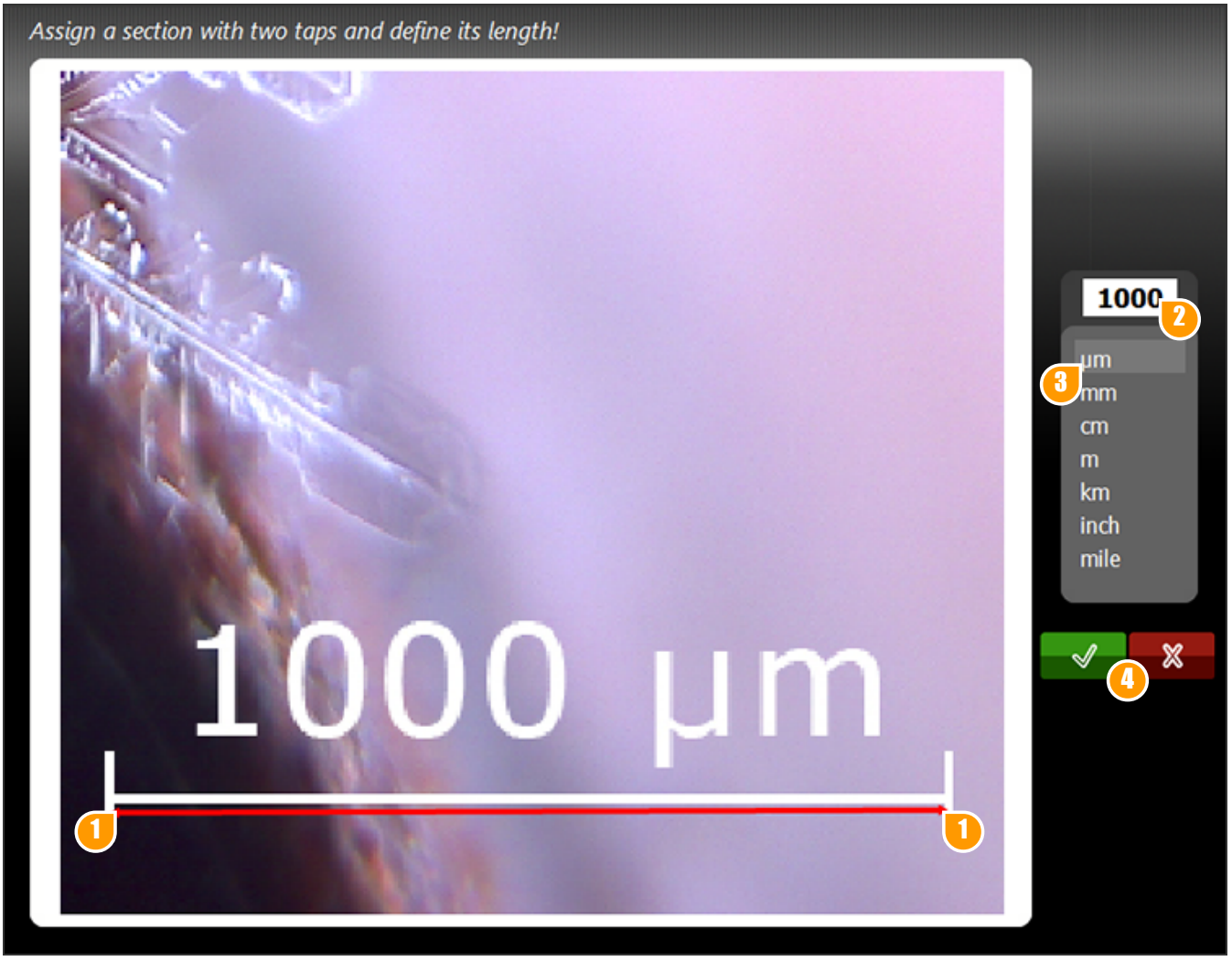
11 Press this button to choose from the following options:

Visual settings | Correct your still image by fine tuning it's brightness, contrast and hues.

Color schemes | Change the color of your measuring tool. Default is red. You can chose different colors for different categories of items.

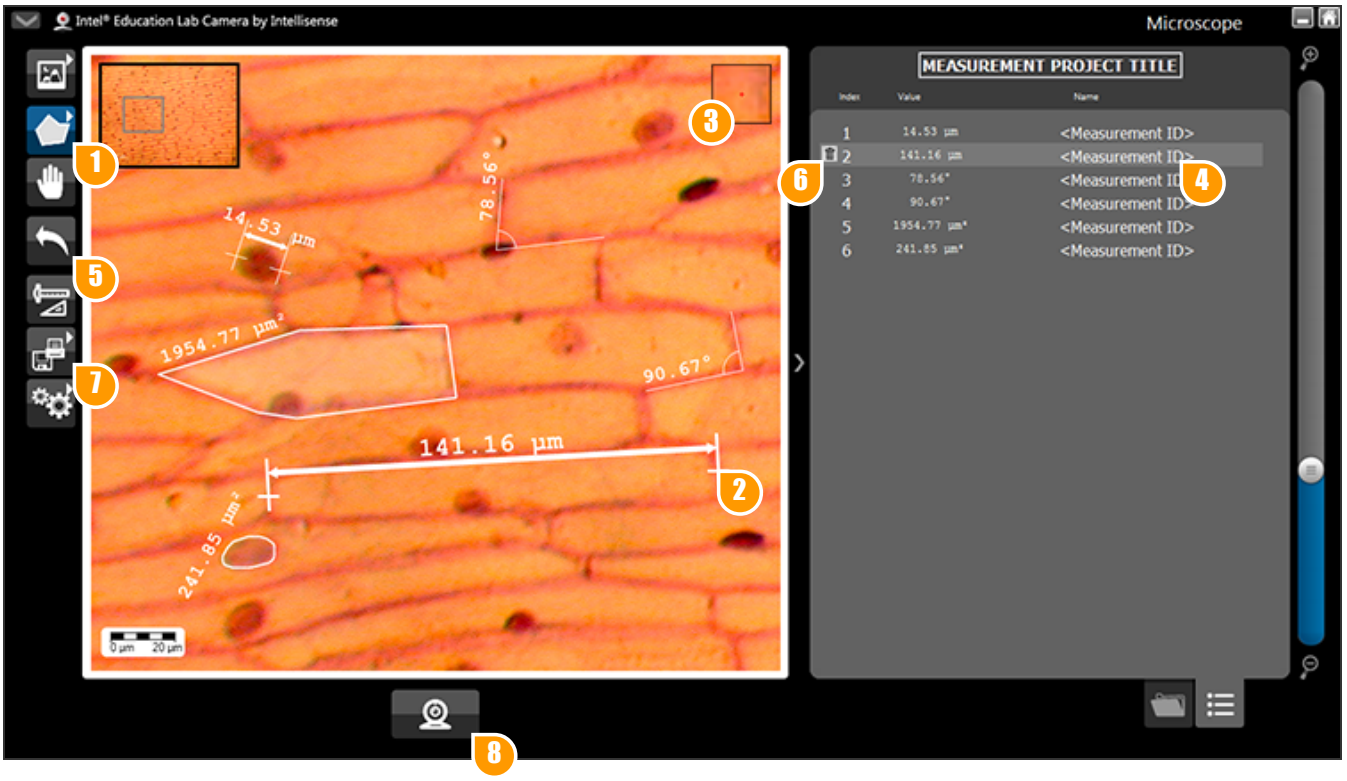
Calibration

Calibration lets you measure objects in your camera view. If you know one dimension of the examined object, you can use it as a reference to calibrate. In order to calibrate your camera view, place an object of known size (eg. mechanical pencil refill lead) in front of the camera in the same plane where your target object is located and tap the calibration button. You can also use our printable scale sheets available at http://www.webcamlaboratory.com/downloads.php



1. Drag the endpoints of your calibration line to match the edges of the object you know the size of. Note: preloaded images come with a calibration scale.
2. Set the size value of the calibrated object.
3. Set the measurement unit.
4. Confirm or decline your choice.

Making Measurements



1. Chose the kind of measurement you would like to make. Available options: length, angle, area.
2. Place the endpoints on the screen. For length measurement you have 2 endpoints, for angle 3. For area measurement you can define as many points as you wish. To close an area, make sure that the last point overlaps with the first one.
3. Use the guide window for precise placing.
4. Your measurements will get displayed in the measurements list. You can edit its description by selecting it.
5. **Undo** | Press to undo last measurent. You can undo as many measurements as you want.
6. Press the bin icon to remove selected measurement.
7. Press this button to choose from the following options:

Save in image format | You can save your work as plain image, image along with your measurements and as a measurement protocol page.

Print | Print your work as plain image, image along with your measurements or as a measurement protocol page.

Save in Microscope format | Your project will be saved in .mic format for later use.

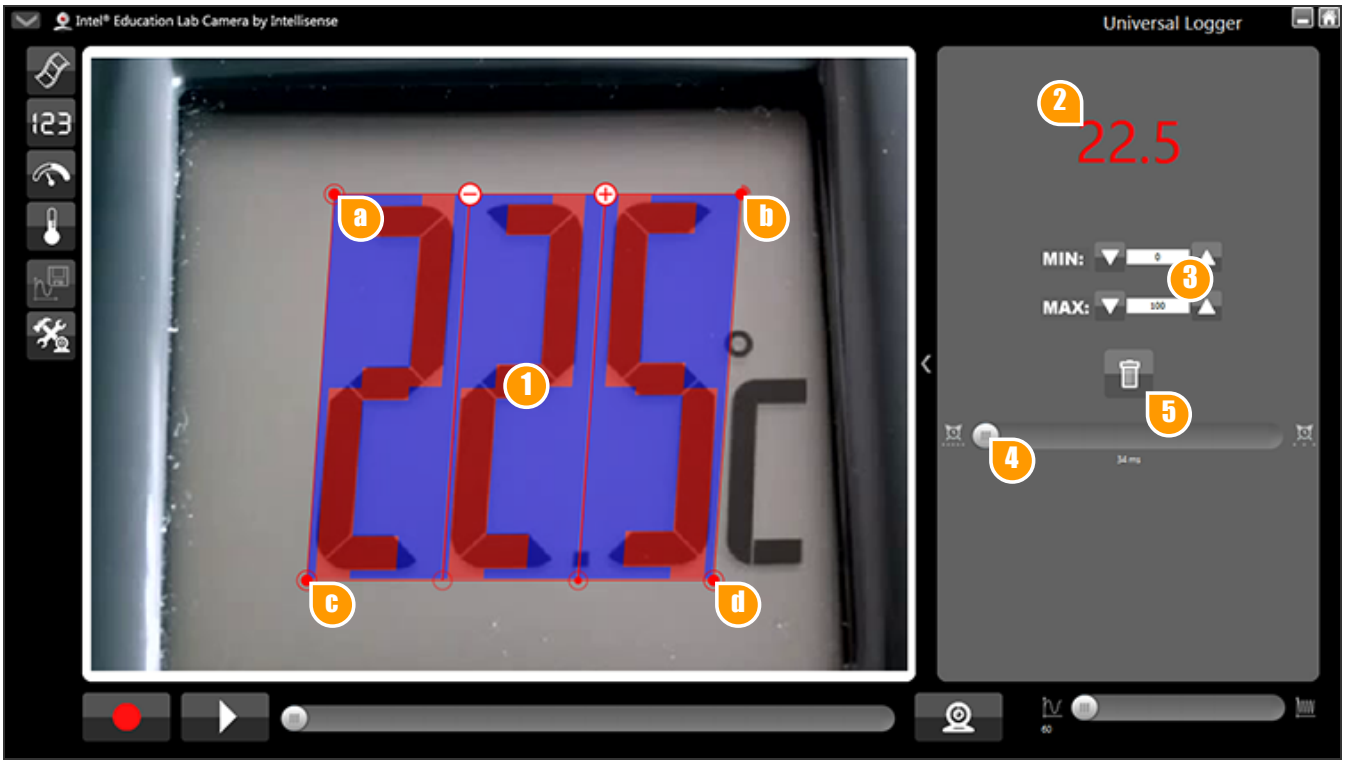
8. **Go back to camera** | Switch to camera view.

UNIVERSAL LOGGER

Universal Logger is a very unique, real time, data recognition module that can register real-time readings of any instrument that has digital, radial dial or liquid-in-glass display. All your obsolete measurement devices in school that cannot be connected to a computer are made useful again.

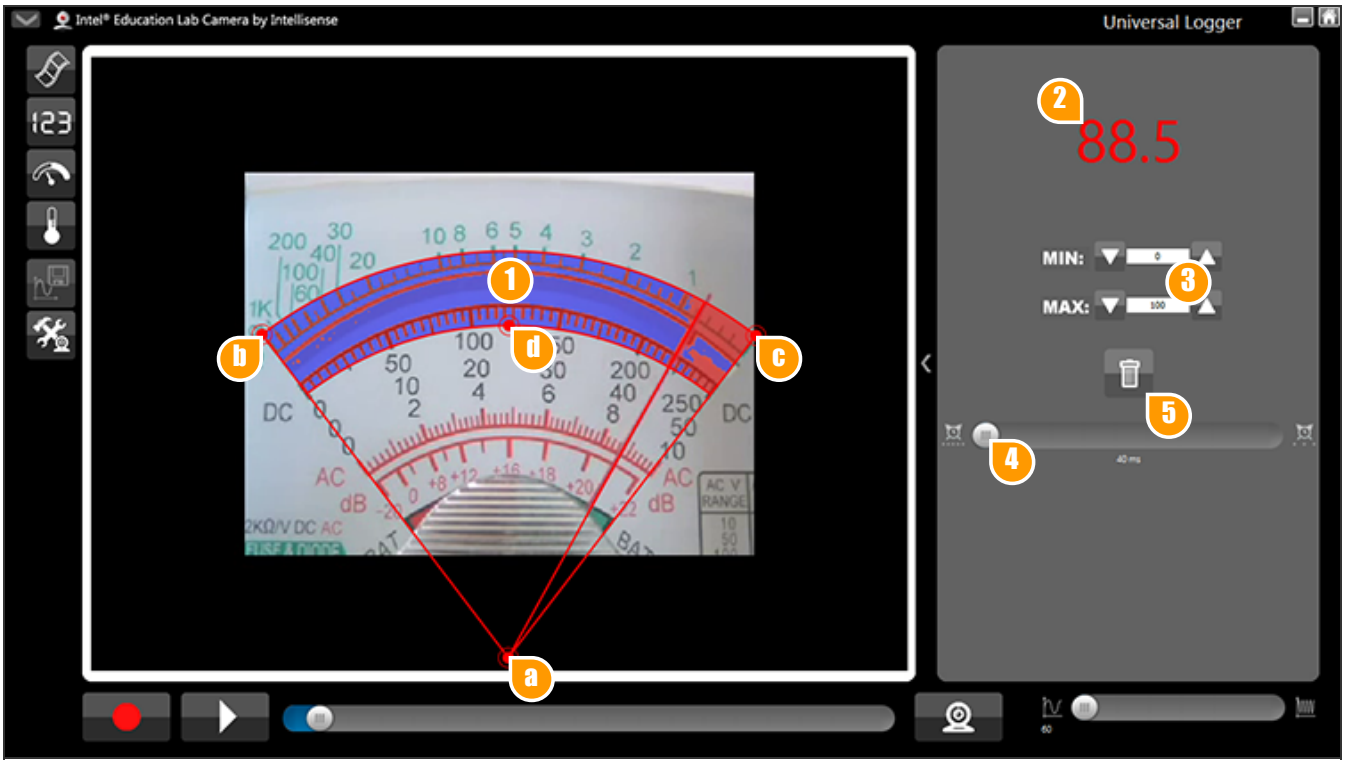
1. Press to use a measuring instrument with digital display.
2. Press to use a measuring instrument with radial dial display.
3. Press to use a liquid-in-glass measuring instrument.
4. **Load video** | Load a pre-recorded video. This feature is particulary useful if there is no time for a real-time setup or the experiment can be dangerous.

Calibration



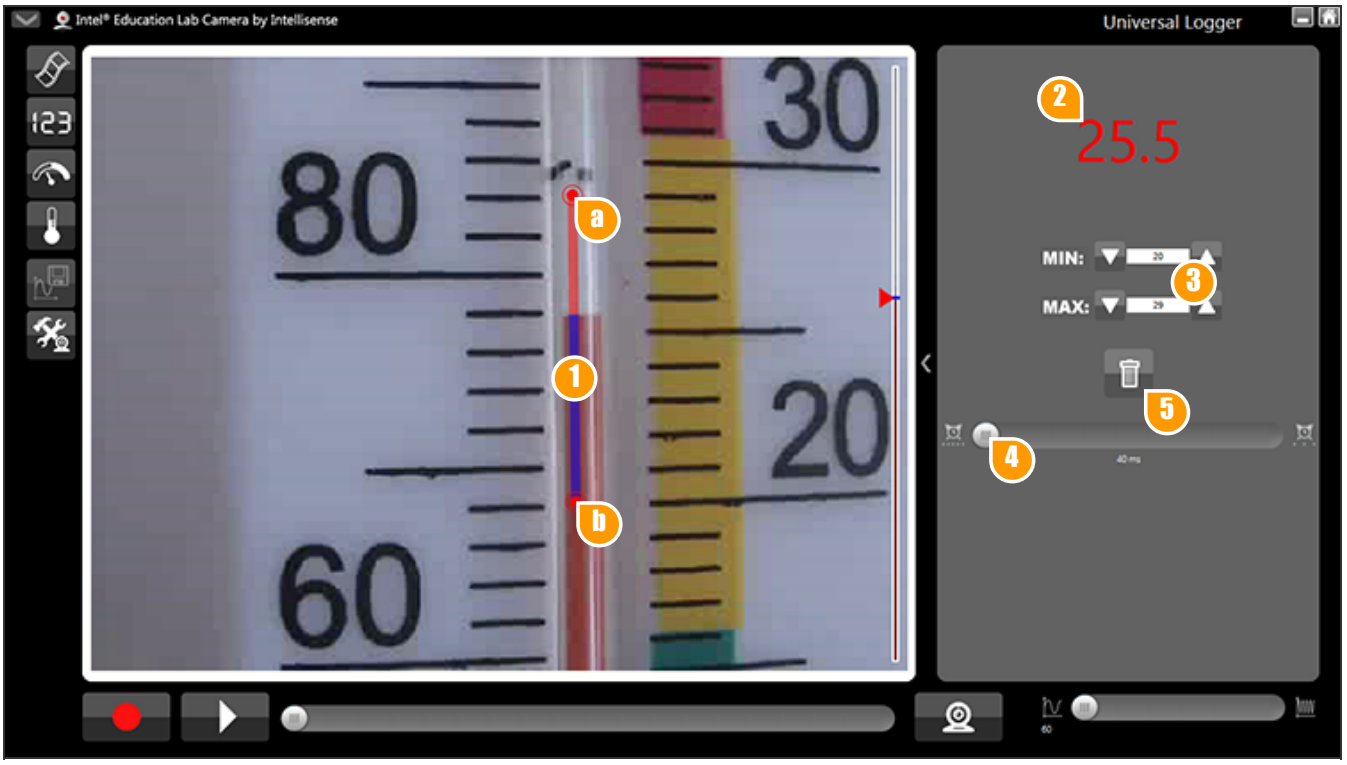
1. When you press the Digital Display icon, a 3-cell grid will appear. Each cell represents one digit on your device. In case you need more or less cells, use the +/- buttons on the top edge of the grid. You can add cells to represent up to 6 digits. Each corner of the main grid is an active corner. The circles on the bottom edge represent the decimal places. Tapping one of them results in placing the decimal mark between the corresponding cells.
   - a. Drag this corner to the top left corner of the display area of your measuring device.
   - b. Drag this corner to rotate the grid.
   - c. Drag this corner to skew the cells in case you have a device with italic digits.
   - d. By dragging this corner you can enlarge/reduce the grid to accommodate all digits on the display.
2. Observe the recognized value and make sure it matches the actual readings of your measurement device.
3. Set the minimum and maximum values of your measurement range.
4. Set the probe interval to desired value. For slow changes the probe interval can be longer. In case of faster changes a shorter interval is recommended to obtain a smooth diagram.
5. Press the bin icon to delete the selected template.

The goal is to align the grid with the display in such a way that each cell covers one digit and the decimal mark is in the same place as on the device. NOTE: reflection of light and insufficient lighting may affect the accuracy of readings.



1. When you press the Radial Dial Display icon, a radial display template will appear. Calibration of this component is similar to the Digital Display icon. Each corner of the template is an active corner.
   - a. Drag the vertex point to move the template around. The vertex point's position should be aligned with the center of rotation of the instrument's hand.
   - b,c. Adjust the two endpoints of the template to accommodate the dial scale of your instrument.
   - d. Set the width of the dial scale.
2. Observe the recognized value and make sure it matches the actual readings of your measurement device.
3. Set the minimum and maximum values of your measurement range.
4. Set the probe interval to desired value. For slow changes the probe interval can be longer. In case of faster changes a shorter interval is recommended to obtain a smooth diagram.
5. Press the bin icon to delete the selected template.

If setup is correct the arm of your template should cover the arm of your instrument. Set the minimum and maximum values of your device using the right panel. Please also note that reflection of light and insufficient lighting may affect the accuracy of readings.



1. When you press the Liquid-in-glass icon, a liquid-in-glass instrument template will appear. Calibration of this component is similar to that of the digital display. Each end of the template is an active end.

a,b Position the template to the image of your instrument to accommodate the reading area. If setup is successful, the readings shown in the right panel should show the actual readings of your instrument.

2. Observe the recognized value and make sure it matches the actual readings of your measurement device.

3. Set the minimum and maximum values of your measurement range.

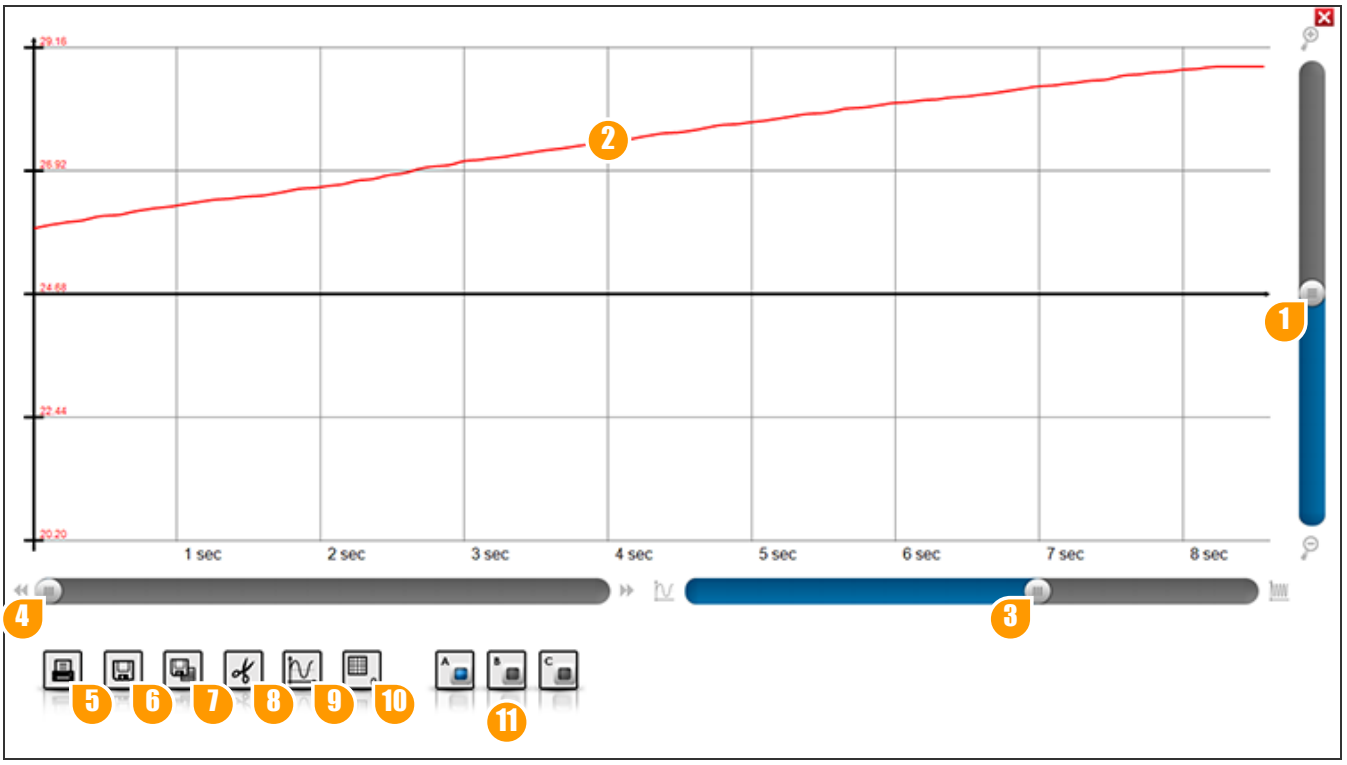
4. Set the probe interval to desired value. For slow changes the probe interval can be longer. In case of faster changes a shorter interval is recommended to obtain a smooth diagram.

5. Press the bin icon to delete the selected template.

Measurement Recording

1. When all set, press the recording button to start logging the measured values.
2. The right panel will display the real-time diagram. You can manipulate the display area using finger gestures.
3. Set diagram density.
4. Press to display the recorded diagram.

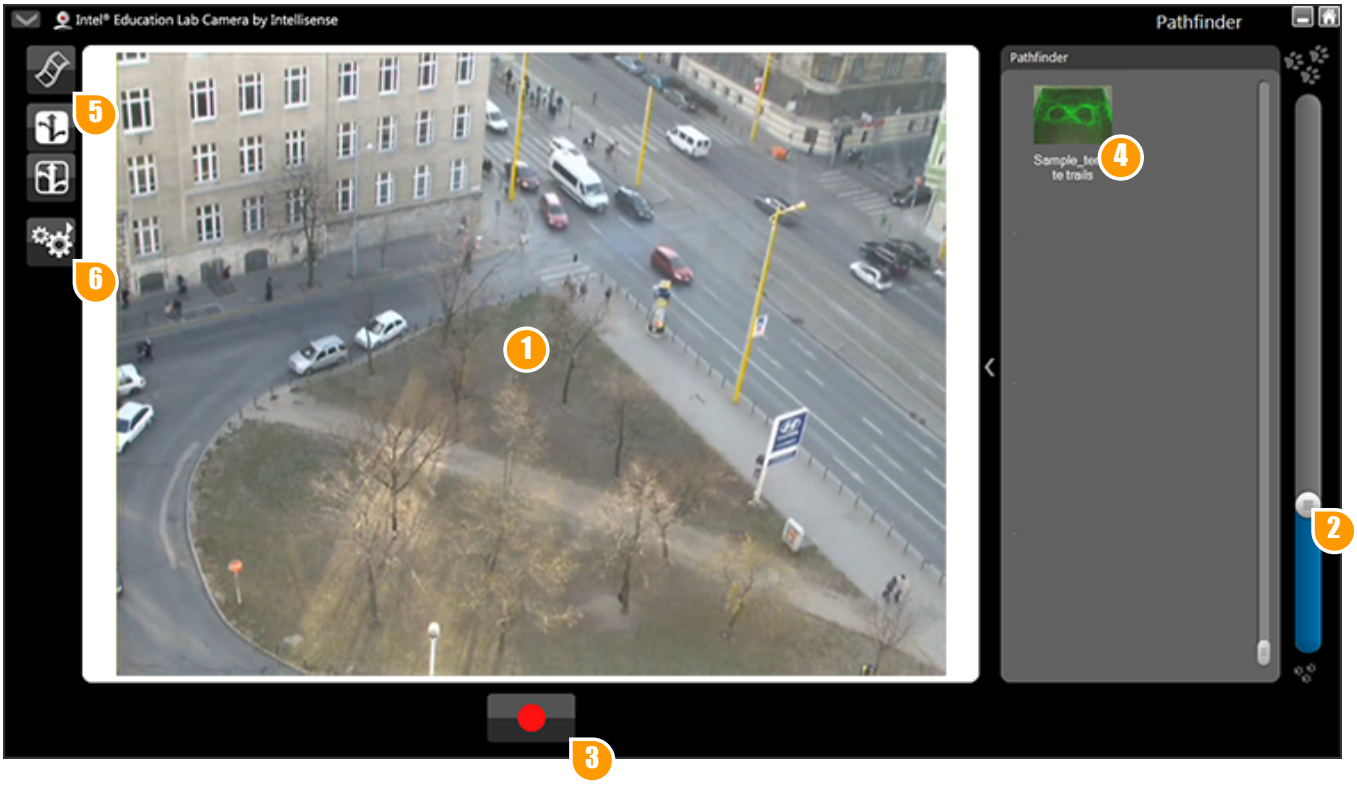
Diagram View



1. Zoom
2. By selecting a point in the diagram, you can display its value and make the diagram draggable vertically.
3. Diagram density
4. Time
5. Print.
6. Save as image
7. Save data table
8. Cut
9. Smooth diagram. Note: In some cases smoothing can significantly alter your diagram.
10. Set grid density.
11. Select the measurement device of which you would like to display the graph.

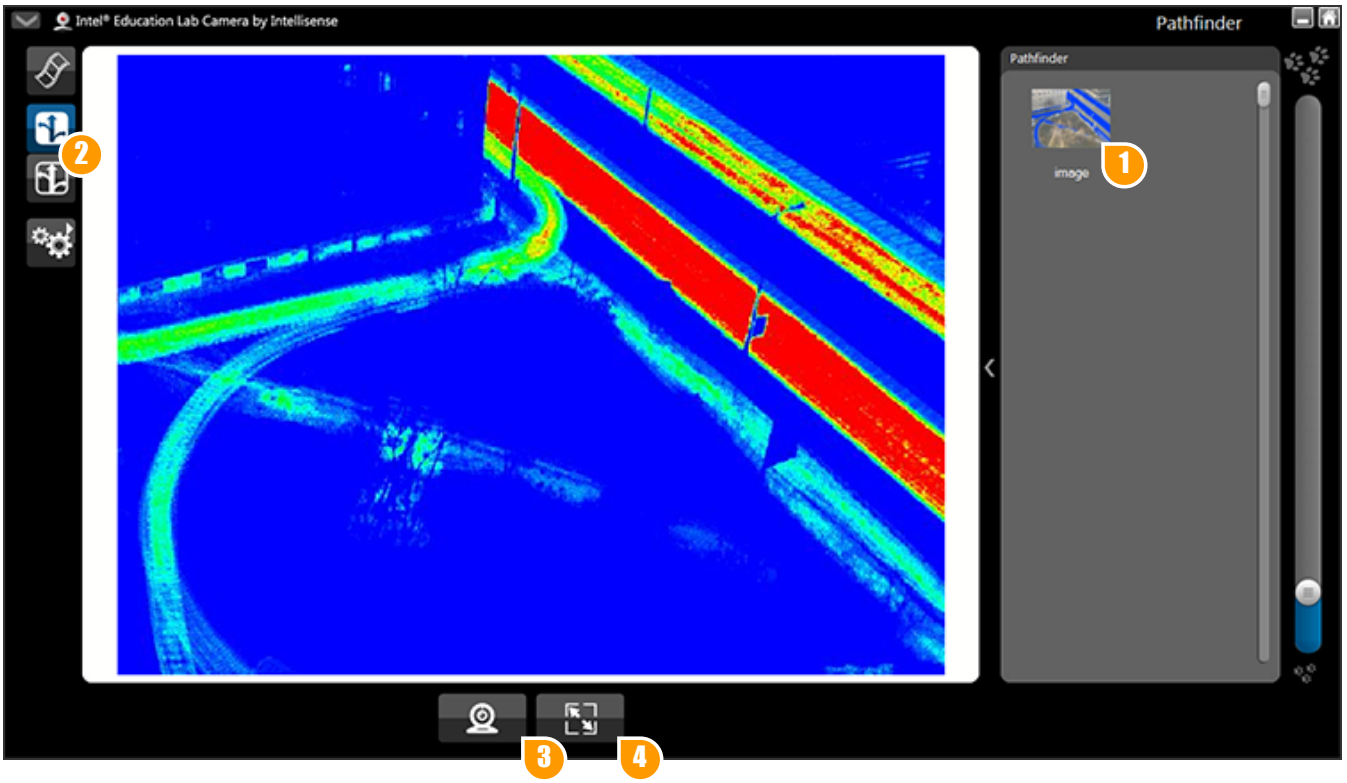
PATHFINDER

Pathfinder is practically a motion density map. The more movement occurs, the more colored the attended trails get on the screen. Enjoy tracking traffic density, single-cell organism or trails of ants in an ant farm.



1. Your camera will start automatically upon software start up. Its stream will be visible in the camera window.
2. Set marking intensity.
3. Press Record button to start recording. A red frame around the camera window will start blinking. Press again to stop recording. Your recorded image will be displayed.
4. Your recorded image will be added to the thumb list. The image file will be saved to your external storage in "/Lab Camera/Pathfinder" folder.
5. Load a pre-recorded video. This feature is particulary useful if there is no time for a real-time setup or the experiment can be dangerous.
6. Press this button to choose from the following options:

   Choose path color.



1. Double click on thumbnail to display image. Note: right clicking or longer press on thumbnail will display file menu.
2. Press to toggle Color Map and Path Map modes.
3. **Go back to camera** | Switch to camera view.
4. **Full screen mode** | View picutre in full screen mode.

GRAPH CHALLENGE

Play with curves and learn representation of movement in a coordinate system using Graph Challenge. All you need to do is pick a curve and select an object. Next, move the selected object or your mobile device around to match your curve as close as you can.

The goal is to move an object in such way that it's movement curve overlaps the predefined curve as much as possible. The software calculates the score in percentage of matching and saves it in the score list.

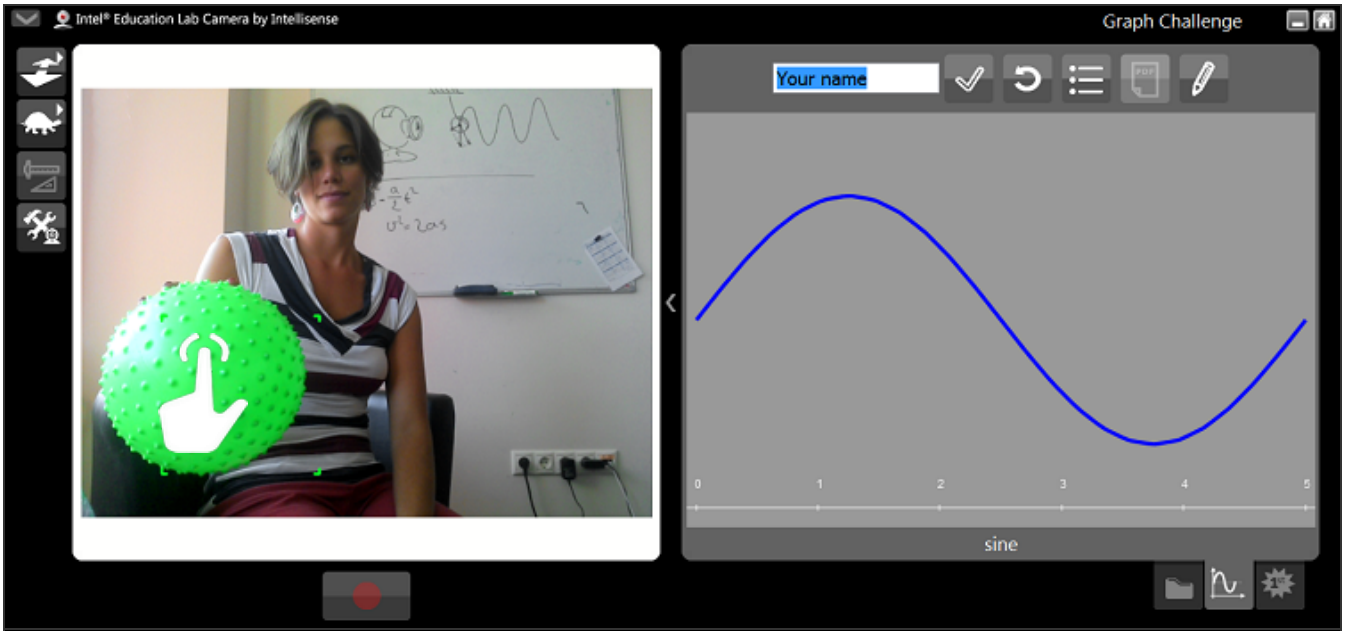
You can chose from horizontal, vertical, closer-further or rotation modes.

Object Tracking

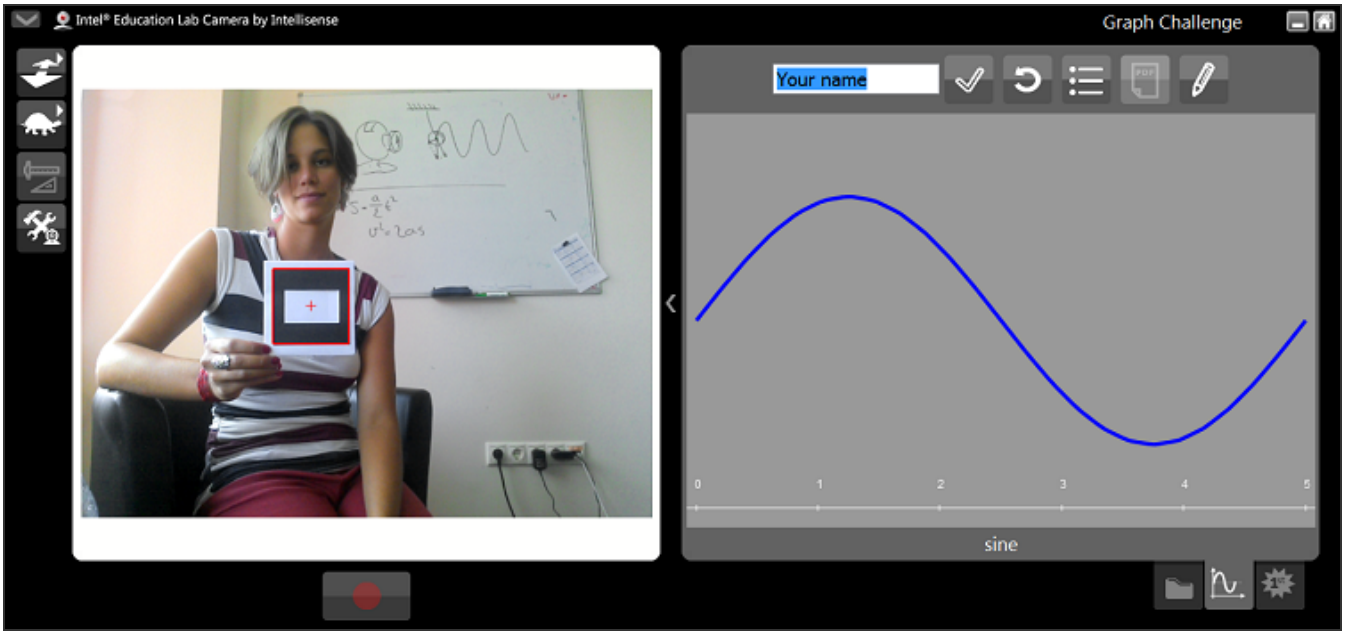
You can use any colored object or a predefined marker with Graph Challenge. If you choose to track a colored object, please make sure that this color doesn't occur in the background of the object. NOTE: Rotation matching is only available when using predefined marker.

You can print the marker from the pdf file located in your Graph Challenge folder or use the image from the appendix at the bottom of this manual.

In order to select a custom (colored) object for tracking, press the object on your camera screen. A colored bounding box around the object will indicate a successful selection.



If you want to use the predefined marker for tracking, all you need to do is to bring the marker into the camera's viewport. It gets recognized automatically and you can start calibration or matching the curve right away. NOTE: when holding the marker, make sure that the whole marker is visible - don't cover the black frame with your fingers.



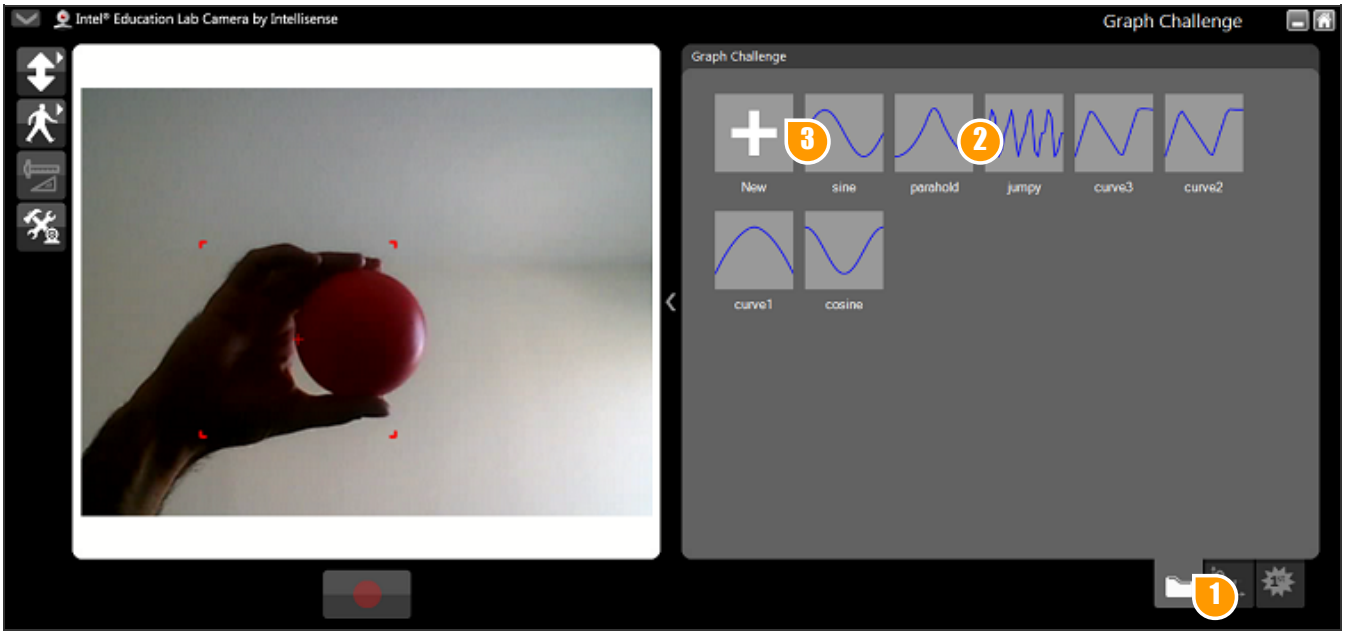
Movement Control

There are two ways to move your object around in the camera view:

- you can either move the object in front of a steady camera, or

- move your camera in front of a steady object.

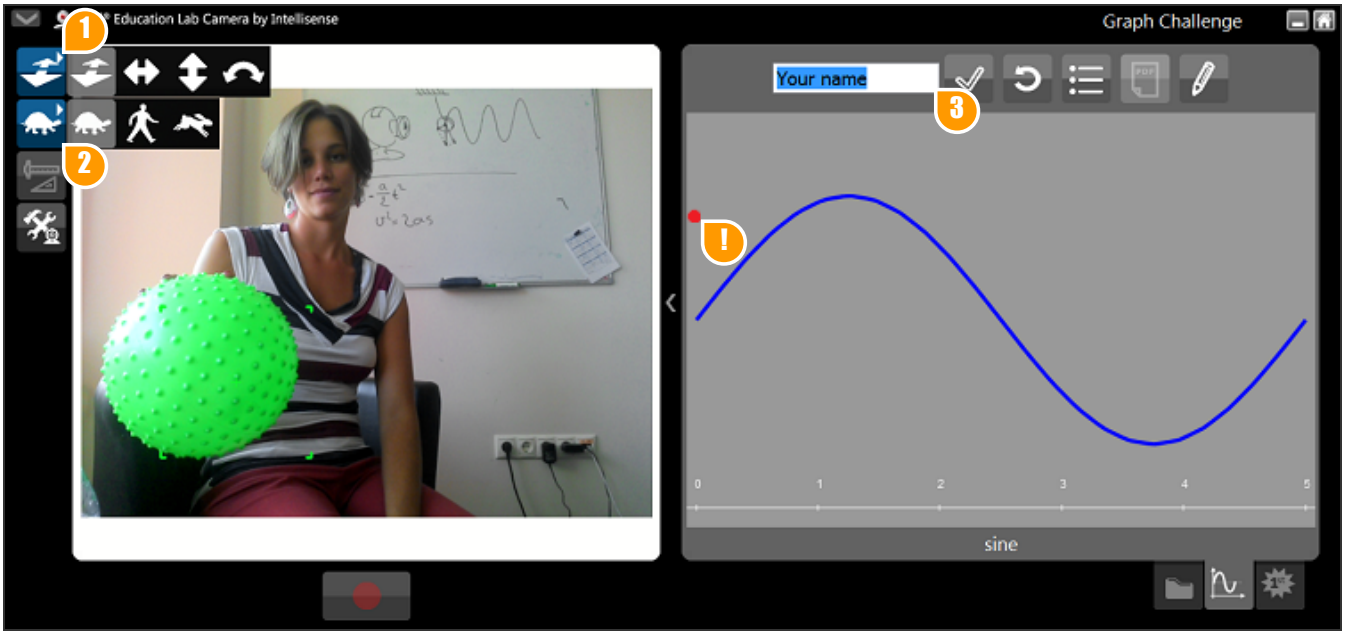
Select A Curve



1. If all set, press the record button to start the challenge!
2. To select a curve, simply press its thumbnail
3. Press the "New" thumbnail to create a new curve. This action will open the editor window. Please find the editor help in the "Curve editor" section below

Game Options

Before starting a game, you need to set it up using the following controls.



1. Set the direction of your movement.

! NOTE: The position dot shows you the current placement of your object. You can chose from one of the following direction modes:

- Closer - further
- Horizontal
- Vertical
- Rotation

2. Set challenge speed

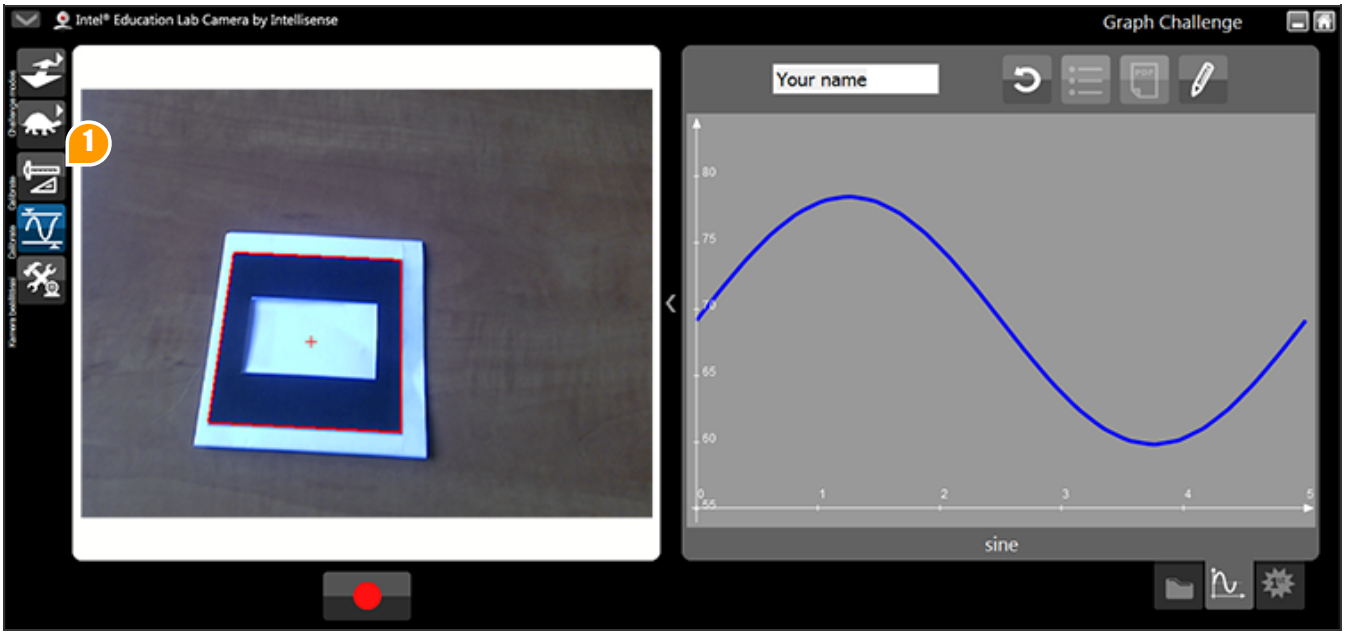
- Slow
- Normal

Fast

3 Optionally, you can input your name here. This name will be displayed in the scores panel and in the hall of fame. Inputting your name is particularly useful if several players take turns to match the same graph and would like to distinguish their results.

Size And Distance Calibration

To make sure that the y-axis of your diagram shows proper values, you will need to calibrate your object's size and / or distance from the camera.

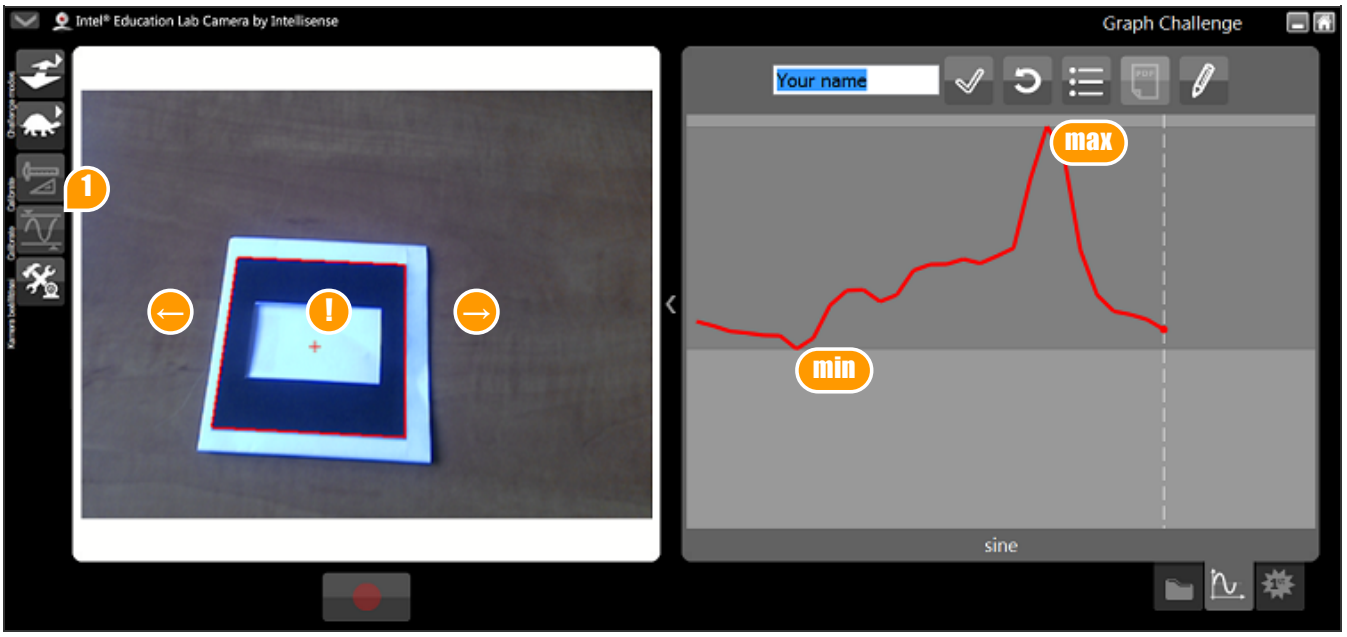


1 Press to start size and distance calibration wizard. The wizard will guide you through the calibration steps.

Movement Area Calibration

After selecting an object for tracking, you will need to calibrate your movement area to make sure that the object's movement can reach highest and lowest values of your curve. Once calibrated, you can use Graph Challenge as many times as you want provided that the placement of your camera and the tracked object is the same as during calibration.

When calibration starts, you will see a curve representing your object's movement in the right panel . Move your object up-down, left-right, closer-further or rotate (depending on the chosen tracking mode) to register the highest and lowest values your curve should accommodate to. After 5 seconds the calibration will stop if there were two clear endpoints registered.

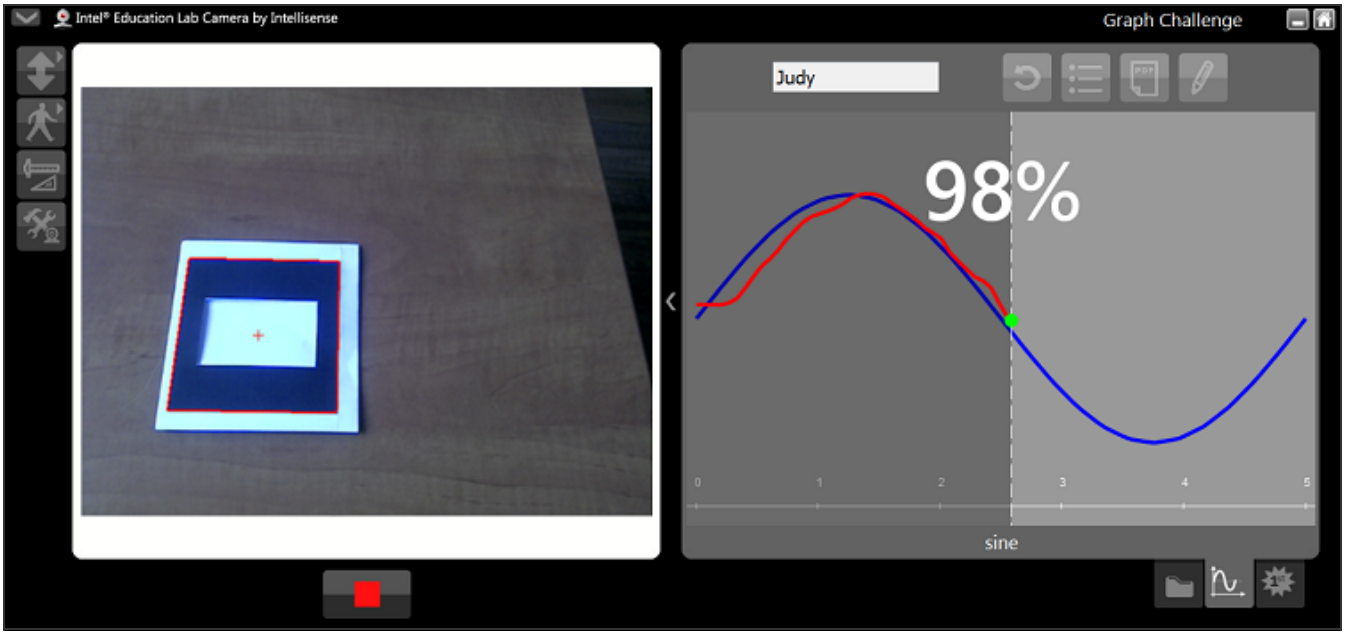


1. Press calibration button located on the bottom bar

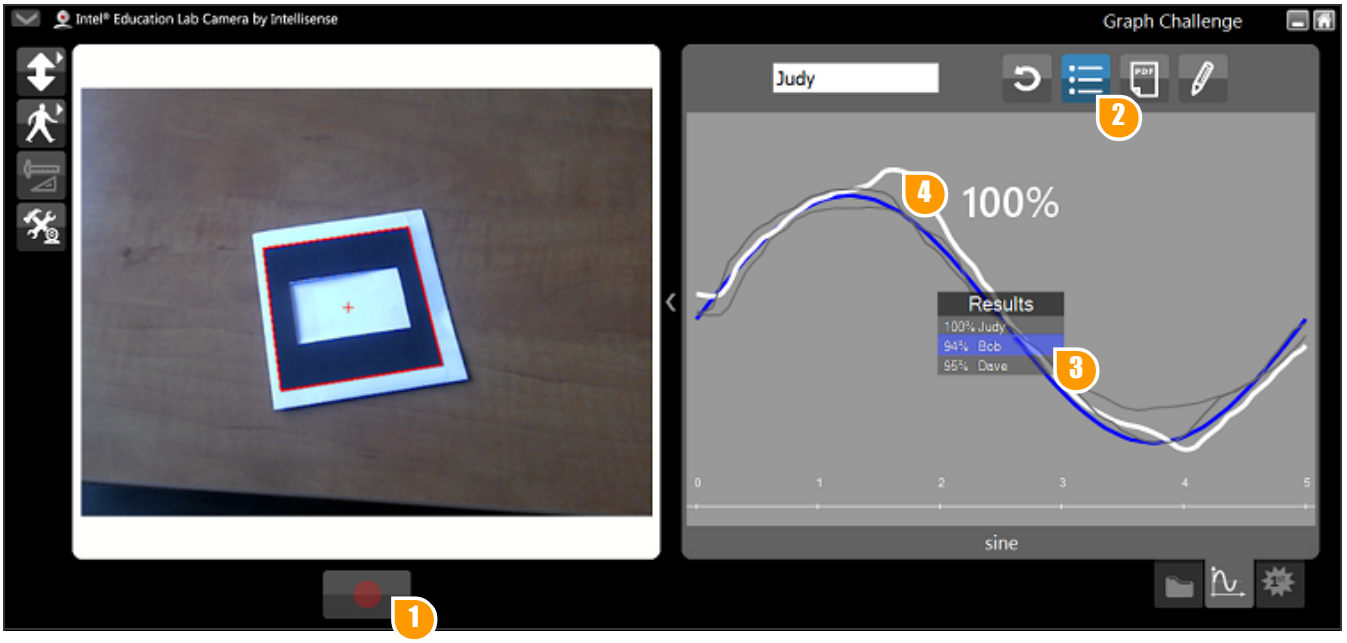
Playing The Challenge

If all set, press the record button to start the challenge!

When you hit start a counter will start counting back from 5. When matching starts, a vertical dashed line will indicate the elapsed time on the curve. Your goal is to match the curve as close as you can. Your score will be displayed continuously.



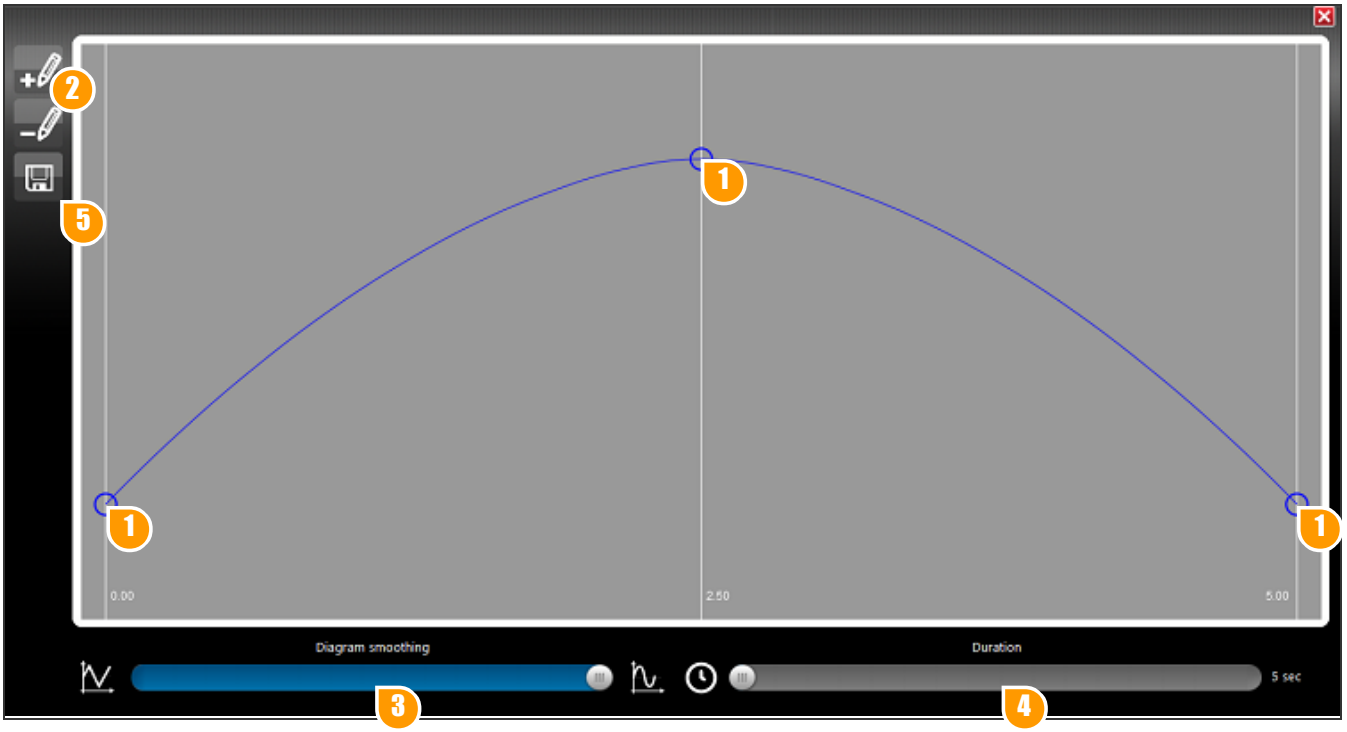
Results



1. Press the "Record" button to start a new challenge with the same settings.
2. Press the "Results" button to display the latest results in this session.

3. The results panel lets you review previous matches in the same session.
4. The selected curve will be highlighted.

Curve Editor



1. Slide the hotspots up or down to change curve shape.
2. Use the Add / Remove points button to define or delete new points for the curve. NOTE: the more points the more complex curves can be created.
3. Smoothen the diagram in order to cut sharp turns.
4. Set the duration of your game. NOTE: The duration combined with the number of defined points will determine the speed of your game.
5. Save your challenge. The saved curve will get displayed in the thumblist.

APPENDIX

Marker Image For Graph Challenge

Please don't cut out the shape, as you need the white background to hold the marker.